

CASE REPORT

Peculiar tendinous origin of the brachialis muscle: anatomic and clinical insight

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Abstract

The current study seeks to elucidate the presence and potential function of an anomalous tendinous origin of the brachialis muscle. The brachialis muscle originates from the humeral shaft, which is usually muscular, thereby becoming tendo-aponeurotic distally towards its insertion. During routine cadaveric dissection, in a 52-year-old cadaver, the anomalous brachialis muscle originated in the form of a tendon measuring 4.4 cm in length. The tendon was attached to the proximal humeral shaft near the lateral lip of inter-tubercular sulcus. The aponeurotic insertion was as usual, into the ulnar coronoid process. The long tendinous origin of the brachialis muscle as observed in the present study could alter the biomechanics of the muscle. A long tendinous origin of the muscle may predispose to frequent tendinous injuries. There are possibilities of the anomalous tendon being used as a graft in elbow injuries. A comprehensive knowledge of such a rare anatomical variation could prove beneficial in surgical, rehabilitation and radiological field.

Keywords: brachialis, muscle, origin, tendon, variation, anomaly, anatomy.

☞ Introduction

Brachialis muscle anatomy has intrigued morphologists, embryologists and surgeons owing to its dual innervation from the musculo-cutaneous and radial nerves. The brachialis, biceps and the coracobrachialis muscles are the chief flexors in the upper arm. Brachialis is the largest contributor to elbow flexion and owing to its lack of role in supination and it is regarded as the key muscle for controlling flexion spasticity [1].

Numerous researchers have endeavored to describe brachialis muscle anatomy, which has various conflicting and contrasting descriptions. Unfortunately, the anomalies pertaining to flexor muscles are commonly found in the extant literature with few variations being reported on the brachialis [2].

The origin of the brachialis in the form of an unusual tendon has never been reported in the literature. A tendinous origin means predisposing to inadvertent injuries. The biomechanics of a flexor may also alter in case the muscle has an abnormally long tendinous origin. We as anatomists believe that variations of brachialis muscle may be important for rehabilitation, surgical and radiological purpose.

☞ Material, Methods and Results

During anatomical dissection, we observed the variation of brachialis in a 52-year-old male cadaver. The brachialis muscle was observed to arise as a peculiar long tendon.

The tendon was attached to the distal end of lateral lip of inter-tubercular sulcus close to the deltoid tuberosity. The tendon measured 4.4 cm in length and broadened into the muscle belly, which originated from the distal humeral shaft (Figure 1).

Proximally, the tendon expanded into an aponeurosis, which merged with pectoralis major muscle. Distally, the muscle had a tendinous as well as an aponeurotic attachment to its usual site on the ulnar coronoid process and tuberosity.

No unusual morphology was observed on the left arm. The musculocutaneous nerve innervated the brachialis muscle. No other associated anomalies were observed.

☞ Discussion

There have been perplexing descriptions of brachialis muscle morphology. Additionally, it has dual innervation from the musculo-cutaneous and the radial nerves. A previous study had described two heads of the brachialis muscle i.e. superficial and deep [3].

The larger superficial head originated close to the deltoid tuberosity, whereas the deep head originated from the distal third of the humeral shaft.

Our observation regarding the brachialis muscle morphology differs considerably from the classical description found in literature.

Anatomists and morphologists depend greatly on research reports to report rare variations as standard textbooks of anatomy fail to list the same.

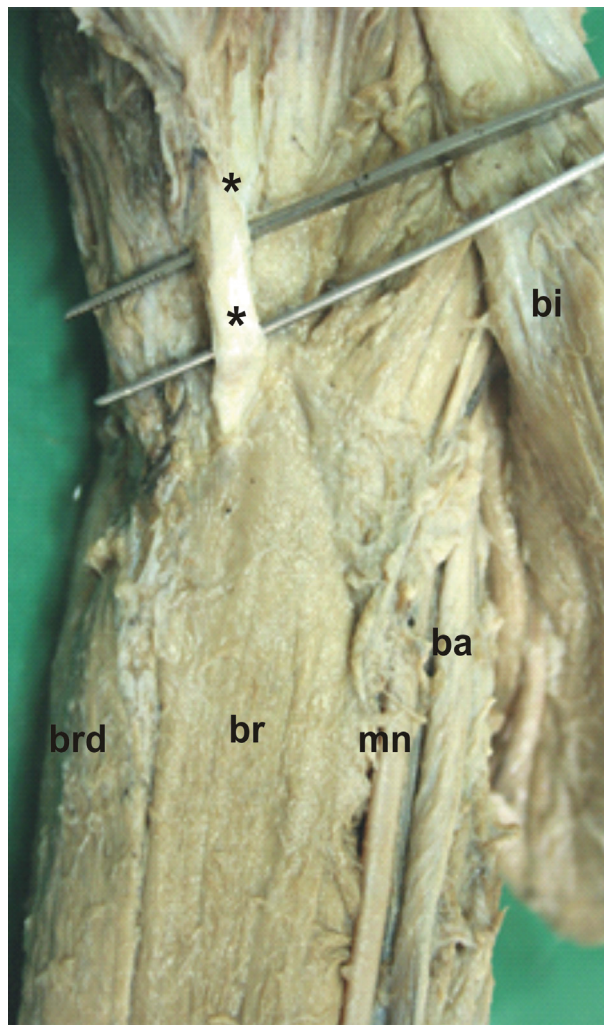


Figure 1 – Photograph of the right upper arm depicting: ** – tendinous origin of brachialis muscle; brd – brachioradialis; bi – biceps brachii muscle; mn – median nerve; ba – brachial artery.

The presence of tendon at the proximal end of the brachialis could certainly warrant biomechanical implications as the elbow joint is considered as a buttress. The tendon of the superficial head of brachialis has been utilized for transfer to the radial tuberosity to improve supination strength. In addition, it may be even used to reconstruct annular ligament of the medial collateral ligament of the elbow.

Ulnar coronoid process fractures are relatively uncommon and they contribute to elbow instability. In the event of such instability, a timely surgical intervention in the form of a tendon transfer could prove useful in the restoration of stability at this vital joint [4].

It is well known fact and a common concern for orthopedic surgeons that elbow joint surgery is cumbersome owing to its complex anatomy. Rehabilitation after elbow surgery is slow and often incomplete. Rupture of distal tendons of biceps brachii and brachioradialis often consists of clean avulsion of the ends from their tuberosities [5]. Treatment in such cases consists of reinsertion of these tendons to the same tuberosity.

The tendinous origin of brachialis muscle as observed in the present study could successfully be

utilized for reinsertion procedures. In fact, these scientists also found that if the new insertion was located further away from the elbow joint axis the shortening velocities of these muscles increased resulting in an overall beneficial effect.

It is a well-known fact that epiphyseal tendons having a prominent zone of fibrocartilage leave markings on bones, which simulate those left by articular surface [6].

However, in the current specimen, after thorough examination of the humeral shaft in the region of inter-tubercular sulcus there were no significant markings found suggesting that perhaps the proximal tendinous attachment have no major role to play in biomechanics. Admittedly, in the present case, we did not have the clinical history to corroborate the fact.

Avulsion of the distal biceps brachii tendon due to heavy weight lifting, although uncommon may be repaired anatomically to brachialis long term follow up revealed no heterotopic bone formation or nerve damage.

Our premise is that this accessory tendon of brachialis muscle, which upon sheer speculation has no functional role, may be used for reconstruction surgeries, and then restoration of supination force may ensue [7].

Tendon transfers are frequently used in obstetrical brachial plexus injuries to restore elbow function [8]. Interestingly, it has been found that the architectural parameters of the brachialis muscle in patients after stroke are elbow-joint-angle-dependent at the rest condition [9].

We as anatomists, opine that the anomalous tendon of brachialis could be utilized effectively and reliably in tendon transfer. Additionally, this tendon at the proximal end of brachialis may augment the action of brachialis in flexion, making it an even more effective.

☐ Conclusions

The current case report assumes paramount importance for orthopedic surgeons and rehabilitation physicians, owing to its uniqueness of origin. A comprehensive knowledge of variations in the upper extremity especially anomalous tendinous origin of the brachialis muscle is extremely useful for reconstructive surgeries. Additionally, its role in reinsertion procedures in cases of ruptures of biceps brachii muscle cannot be overlooked. The anomalous tendon at the proximal end of brachialis muscle has not been reported in literature to the best of our knowledge.

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